

### **REMARKS**

Claims 2-21 are pending in the instant application. No claim amendments have been made. Applicants request reconsideration of the rejections based on the following remarks.

As an initial matter, Applicants state that subject to the Notice of Panel Decision from Pre-Appeal Brief Review, mailed on January 11, 2010, the following rejections under 35 U.S.C. § 103(a) were overcome due to clear errors and/or omissions, and prosecution was reopened:

(1) Claims 2-6, 8-11, 14, 16, 20 and 21 were rejected under 35 USC 103(a) as obvious over US 5,082,975 (herein referred to as “Todd”);

(2) Claims 7 and 16-19 were rejected under 35 USC 103(a) as obvious over US 5,082,975 (Todd ‘975) in view of Simpson (J. Inst. Brew. 1987, vol. 93, pp. 405-406 (herein referred to as Simpson)); and

(3) Claims 12 and 13 were rejected under 35 USC 103(a) as obvious over US 5,082,975 (Todd) in view of Simpson, and further in view of US 4,002,683 (Todd 2).

#### **Rejection under 35 U.S.C. § 103(a)**

Claims 2-6, 8-11, 14-15, and 20-21 are rejected as being unpatentable over Todd et al. (US 5,082,975) in view of Alcohol Distillers Handbook (“Handbook”), Righelato et al. (Phil. Trans. R. Soc. Lond. B 290, (1980), 303-312) and Richards et al. (Plant Physiology, 1932, 7(1), 139-144).

Applicants note that the rejection of the primary reference (Todd) has been withdrawn as stated above. The arguments regarding the Todd reference are repeated here for the sake of completeness.

On page 6, first paragraph, lines 15-18 of the Action, it is alleged that one of ordinary skill in the art would have been motivated to add hop acids solutions to the yeast growing tank, and then to transfer the mixture to the fermentation vessel. For support, the Examiner indicates that Todd discloses the addition of hexahydrolupulone to a yeast culture to inhibit the growth of Lactobacillus therein (Todd, column 3, lines 7-8). However, such a broadbrush interpretation fails to recognize fundamental differences in the Todd subject matter compared to Applicants’

claimed subject matter. The Todd teaching must inherently relate to anaerobic conditions, which are distinct and distinguishable from Applicants' claimed aerobic conditions in the yeast growing step. Todd's disclosure that treatment of a sugar solution inoculated with yeast, with a hexahydrolupulone aqueous solution, did NOT inhibit fermentation (Todd, column 8, lines 3-4; emphasis added) further evidences that Todd's teachings relate only to anaerobic conditions, and not Applicants' aerobic yeast growing step.

The Applicants' currently pending claims include a method step wherein a hop acid salt solution and yeast are added into a yeast growing tank under aerobic conditions. Under such reaction conditions, yeast will be growing and fermentation will be minimized due to the aerobic conditions. This is clearly distinct from the Todd reference which states that treatment of a 10% sugar solution, inoculated with yeast, with a 20% hexahydrolupulone solution, did NOT inhibit fermentation. Todd simply does not teach or suggest a separate step to grow yeast under aerobic conditions that minimizes fermentation.

Todd is directed towards a synthetic method of converting beta acids into reduced beta acids. Todd indicates that beta acids may be added to a yeast culture to inhibit bacterial growth (column 3, lines 7-8), and that the reduced beta acids may be used in the brewhouse (column 8, lines 5-10). Additionally, Todd discloses that treatment of a sugar solution inoculated with yeast, with an alkaline beta hop acid solution in water, did NOT inhibit fermentation.

The Applicants' claims include a distinct and separate step wherein the aqueous alkaline solution of hop acid and yeast are added into a yeast growing tank under aerobic conditions, in order to allow the yeast to grow while avoiding/minimizing fermentation. The reason that fermentation is minimized at this point is that a buildup of ethanol resulting from fermentation will destroy the activity of the yeast. The motivation for yeast growing (in Applicants' claimed subject matter but not taught or suggested in Todd) is distinct and in fact contrary to the motivation for yeast use in Todd. Thus, the motivation of the yeast growing step is to maximize yeast growth in the presence of oxygen while at the same time minimizing fermentation, so that the yeast can be used later in the fermentation vessel.

In addition to the above, the subject matter of Todd actually is focused on a synthetic methodology for making hexahydrolupulone compounds. Aqueous alkaline solutions of hexahydrolupulone or beta hop acids happen to be provided in Examples 1 and 5 of Todd, but such alkaline solutions of hop acids are NOT used by Todd to inhibit bacterial growth. The aqueous alkaline solutions of hop acids presented by Todd are made for the purpose of purifying and/or extracting (i.e., separating from undesired catalyst poisons) the hop acids after a hydrogenation reaction, then acidified to give back more highly purified hop acids (in their acid form). Example 6 of Todd provides for the use of hexahydrolupulone to inhibit bacterial growth using hexahydrolupulone dissolved in water and glycerine. Example 6 does NOT provide for an aqueous alkaline solution, nor for an aqueous alkaline solution of hop acid used to inhibit bacterial growth.

The only exemplification of the use of hop acids to inhibit bacteria is found in Example 6, but Example 6 simply does not use an aqueous alkaline solution of hop acids, and such a solution is not used prior to fermentation. Thus, Todd simply does not provide a teaching or suggestion of an aqueous alkaline solution of hop acid used to inhibit bacterial growth, and certainly not relating to pre-fermentation yeast treatment under aerobic conditions (as claimed by Applicants).

It is alleged that Handbook provides that hops extract is occasionally used with water for preparation of yeast mashes because it contains resins and is believed to inhibit the growth of microorganisms. Handbook simply provides a general text of adding a hop extract to water to form a yeast mash. Applicants note that Handbook provides for a hop extract, not an aqueous alkaline solution of hop acids. Handbook does not teach or suggest anything that would rectify the deficiencies of Todd stated above. No combination of Todd and Handbook provides any teaching or suggestion of a distinct and separate step wherein an alkaline solution of hop acids and yeast are added into a yeast growing tank under aerobic conditions, in order to allow the yeast to grow while avoiding/minimizing fermentation. Additionally, no combination of Todd and Handbook teaches or suggests two distinct steps wherein in one step, yeast is propagated under aerobic conditions in the presence of a hop acid solution, and then in another step, the yeast and hop acid solution is subjected to anaerobic fermentation conditions.

It is alleged that Righelato describes “fermentation, the anaerobic catabolism of carbohydrates, proceeds by the oxidation of sugars to pyruvic acid...” It is further alleged that Richards discloses consumption of oxygen during yeast growth. The Action then states that one of ordinary skill in the art would have been motivated by Todd to employ conventional conditions for alcohol fermentation and yeast growth such as aerobic conditions for yeast growth and anaerobic conditions for fermentation.

Applicants contend that Righelato simply provides a general text of fermentation using various sugar sources. There is nothing in Righelato that provides for a hop acid or an aqueous alkaline solution of hop acids. Righelato does not teach or suggest anything that would rectify the deficiencies of Todd stated above. In fact, Applicants submit that the combination of Todd and Righelato teaches nothing more than what is already disclosed in Todd. No combination of Todd and Righelato provides any teaching or suggestion of a distinct and separate step wherein an alkaline solution of hop acids and yeast are added into a yeast growing tank under aerobic conditions, in order to allow the yeast to grow while avoiding/minimizing fermentation. Additionally, no combination of Todd and Righelato teaches or suggests two distinct steps wherein in one step, yeast is propagated under aerobic conditions in the presence of a hop acid solution, and then in another step, the yeast and hop acid solution is subjected to anaerobic fermentation conditions.

Richards is directed towards measuring the amount of oxygen consumption and carbon dioxide production by yeast under aerobic conditions. There is nothing in Richards that provides for a hop acid or an aqueous alkaline solution of hop acids. Further, there is nothing in Richards that teaches or suggests that the grown yeast is added to a process medium, regardless of whether or not hop acids are included. Richards does not teach or suggest anything that would rectify the deficiencies of Todd stated above. No combination of Todd and Richards provides any teaching or suggestion of a distinct and separate step wherein an alkaline solution of hop acids and yeast are added into a yeast growing tank under aerobic conditions, in order to allow the yeast to grow while avoiding/minimizing fermentation. Additionally, no combination of Todd and Richards teaches or suggests two distinct steps wherein in one step, yeast is propagated under aerobic conditions in the presence of a hop acid solution, and then in another step, the yeast and hop acid solution is subjected to anaerobic fermentation conditions.

For the reasons stated above, Applicants submit that Todd in combination with any or all of Handbook, Righelato, or Richards, does not provide any motivation, reasonable expectation of success, or provide a disclosure of all of the elements of the Applicants' claims as pending. Applicants submit that the rejection is overcome and respectfully request withdrawal of the rejection.

Claims 7 and 16-19 are rejected as being unpatentable over Todd et al. (US 5,082,975) in view of Alcohol Distillers Handbook ("Handbook"), Righelato et al. (Phil. Trans. R. Soc. Lond. B 290, (1980), 303-312) and Richards et al. (Plant Physiology, 1932, 7(1), 139-144), and further in view of Simpson (J. Inst. Brew., 1987, 93, 405-406). It is alleged that Simpson discloses aqueous alkaline solutions of isomerized hop acids in an example using ISOHOPCO<sub>2</sub>N.

As indicated previously, the rejection of claims 7 and 16-19 over the combination of Todd and Simpson, has been overcome to due clear errors and/or omissions (see Notice of Panel Decision from Pre-Appeal Brief Review, mailed on January 11, 2010). Applicants have provided arguments regarding Handbook, Righelato, and Richards, and have demonstrated that any or all of the three references in combination with Todd, fails to provide for the methods of the claimed invention. The rejection is obviated and withdrawal of the rejection is requested.

Claims 12 and 13 are rejected as being unpatentable over Todd et al. (US 5,082,975) in view of Alcohol Distillers Handbook ("Handbook"), Righelato et al. (Phil. Trans. R. Soc. Lond. B 290, (1980), 303-312) and Richards et al. (Plant Physiology, 1932, 7(1), 139-144), and further in view of Simpson (J. Inst. Brew., 1987, 93, 405-406), and further in view of US 4,002,863 (herein referred to as "Todd 2").

As indicated previously, the rejection of claims 12 and 13 over the combination of Todd and Simpson in view of Todd 2, has been overcome to due clear errors and/or omissions (see Notice of Panel Decision from Pre-Appeal Brief Review, mailed on January 11, 2010). Applicants have provided arguments regarding Handbook, Righelato, and Richards, and have demonstrated that any or all of the three references in combination with Todd, fails to provide for the methods of the claimed invention. The rejection is obviated and withdrawal of the rejection is requested.

Applicants further reiterate the advantages of the invention, as previously described in a declaration under 37 CFR 1.132, executed by Chris Most and filed on September 19, 2008, and the Pre-Appeal Brief Remarks, filed on December 16, 2009.

Mr. Most (who is not an applicant in this matter) supervised or conducted experiments to examine the effect of hop acids in fuel ethanol production. Mr. Most indicates that it is his expert opinion that one of ordinary skill in this field would not have expected the use of hops acids in the manner described in Applicants' application to have any appreciable effects on fuel ethanol production.

Mr. Most also indicated that the addition of aqueous alkaline solutions of hop acids, administered pre-fermentation during the production of fuel ethanol in processes conducted by him or under his supervision, provided numerous surprising and unexpected benefits in the fuel ethanol production process including healthier yeast counts, increased throughput capacity, improved maintenance of acceptable alcohol levels, and increased "backset." Specifically, the Most Declaration states that increased "backset" is particularly useful in decreasing cost and starting materials through water recycling, greater pollution control, reduction of liquid residue required, and reduction in acidity.

None of the aforementioned advantages is taught or suggested by Todd, whether alone or in combination with any of the references cited in the Action. Thus even, *arguendo*, were a *prima facie* case of obviousness established based on Todd alone or in combination with any of the references cited in the Action (which Applicants do not believe has been established), the Most Declaration provides a showing of surprising and unexpected benefits (both in variety and level) of Applicants' claimed subject matter that is more than sufficient to overcome the rejection.

#### Double Patenting Rejections

Claims 2-21 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 41 and 43-47 of co-pending Application No. 11/473,533, claims 34-40 of co-pending Application No. 10/361,976,

and claims 1-40 of co-pending Application No. 10/545,326. Applicants note that Application No. 10/545,326 has gone abandoned. Applicants have addressed all other rejections and therefore, pursuant to MPEP 1490(V)(D), as the provisional obviousness type double patenting rejection is the only rejection remaining, and applications 11/473,533 and 10/361,976 are still pending applications, Applicants request withdrawal of the rejections and allowance of this application.

In view of the above remarks, Applicants believe the pending application is in condition for allowance. Should any of the claims not be found to be allowable, the Examiner is requested to telephone Applicants' undersigned representative at the number below. Applicants thank the Examiner in advance for this courtesy.

The Director is hereby authorized to charge or credit any deficiency in the fees filed, asserted to be filed or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account No. 04-1105, under Order No. 51035-61755.

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Respectfully submitted,

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